Role of geometric frustration on magnetism and quantum criticality in correlated electron systems

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In this talk I will review some recent examples where geometric frustration, spin-orbit coupling plays a decisive role in magnetism. First, I will compare the fate of the long-wavelength helical order in the weak itinerant magnet MnSi under hydrostatic pressure at low temperatures [leading to partial magnetic order [1] compared to the temperature driven transition [2]. Mn5Si3 is a hexagonal antiferromagnet with collinear and non-collinear phases at low temperature. We observe a large topological Hall effect in the non-collinear phase [3]. Finally, the heavy-fermion compound CePdAl with a distorted kagomé structure exhibits antiferromagnetic order with 1/3 of the Ce moments not partaking in the ordering due to geometric frustration [4]. A quantum phase transition can be reached upon partial replacement of Pd by Ni [5]. I will discuss the unusual features of this transition and the possibility of a spin liquid in CePdAl.

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[5] C. Fritsch et al., Phys. Rev. B 89, 054416 (2014)